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EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
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1745

6

DATE MAILED: 03/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/025,399

Applicant(s)

PHAM ET AL.

Examiner

Gregg Cantelmo

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 11-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Response to Amendment***

1. In response to the amendment received January 14, 2003:

- a. Claim 10 has been cancelled;
- b. The specification objection regarding the claim to priority stands;
- c. The claim objections are withdrawn in light of the amendment;
- d. The 112 rejections are withdrawn in light of the amendment;
- e. The prior art rejections of record stand.

***Specification***

2. The disclosure is objected to because of the following informalities: the priority claim on page 1 of the specification is not at the first line of the specification. In particular paragraph [0001] precedes the priority claim. See 37 CFR 1.78 (a) (5), incorporated herein. Applicant is advised to correct the location of the priority statement and further to update the status of this Application. Further the status of the application listed on page 6, line 2 should also be updated. Appropriate correction is required.

***Response to Amendment***

3. Applicant failed to address the outstanding specification objection above as iterated in the previous office action. Therefore this objection stands.

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***Claim R ejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

~~(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.~~

5. Claims 1-3, 6-9 and 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,350,641 (Mogensen) in view of EP 0 275 356 A (EP '356) and U.S. patent No. 5,937,264 (Wallin).

With respect to claims 1-3 and 6-9:

Mogensen discloses a solid oxide fuel cell (SOFC), comprising an anode including doped ceria, and electrolyte and a cathode (abstract and col. 3, line 9 through col. 4, line 4 as applied to claim 1). Note that the operating temperature of claim 1 does not further limit the SOFC fuel cell system. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein. Furthermore, the prior art obviating claim 1 would have a reasonable expectation of success for operation within the temperature range of claim 1, absent clear evidence to the contrary.

The anode is composed of NiO/doped ceria (col. 2, ll. 19-52 as applied to claim 2).

The doping material in the ceria can be gadolinium oxide, lanthanide oxide and yttria oxide (col. 4, ll. 1-3 as applied to claim 3).

The differences between the instant claims and Mogensen are that Mogensen ~~does not teach of the electrolyte containing doped-ceria (claims 1 and 6) or of the~~ cathode containing a cobalt iron based material (claim 1) and more particularly a cathode material of either  $(\text{La}, \text{Sr})(\text{Co}, \text{Fe})\text{O}_3$  or  $(\text{La}, \text{Ca})(\text{Co}, \text{Fe}, \text{Mn})\text{O}_3$  (claim 7) of the fuel cell operating at a temperature in the range of 400-700° C (claim 1) of the doped-ceria comprising doped-ceria formed from a process of colloid spray deposition or aerosol spray casting (claim 8), wherein the cobalt iron based material is deposited by colloid spray deposition or aerosol spray casting (claim 9).

With respect to the electrolyte containing doped ceria (claims 1 and 6):

The electrolyte of Mogensen is YSZ (yttria stabilized zirconia).

EP '356 discloses that doped ceria electrolytes ( $\text{CeO}_2$  doped with materials such as  $\text{CaO}$  or  $\text{Gd}_2\text{O}_3$ ) compared to zirconia based electrolytes are preferable since the exhibit higher conductivity than the zirconia based electrolytes and can be operated at lower temperatures (page 3, ll. 42-45).

The motivation for using doped-ceria electrolyte is that it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by using doped-

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ceria electrolyte since it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

~~With respect to the cathode containing cobalt iron based material (claims 1 and 7):~~

Wallin discloses of an electrode/electrolyte combination used in solid oxide fuel cells (abstract, col. 1, ll. 12-20, and col. 3, ll. 13-15 and 56-65) wherein the ion-conducting material in the electrode is a number of perovskite compositions. In particular when the ionically conductive material is ceria or doped ceria, Wallin teaches that the electrocatalyst in the electrode is preferably a cobalt iron based material, and further a  $\text{LaSrFeCoO}_3$  material (col. 6, ll. 7-9).

The motivation for using a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode to be a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  since it would have lowered the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

With respect to the operating temperature of claim 1:

As discussed above, EP '356 discloses that the use of doped-ceria electrolytes provide much higher conductivity than zirconia based electrolytes. Thus there is ample motivation for replacing the zirconia electrolyte of Mogensen with a doped-ceria electrolyte to provide an electrolyte having a higher conductivity at lower operational temperatures. The combination of the teachings of Mogensen, EP and Wallin as set forth above teach all of the same components as recited in claim 1. Since the components are the same, there is a reasonable expectation of success that the fuel cell described above would effectively operate at an operational temperature of 550° C and achieve the same power outputs, absent clear evidence to the contrary. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

"[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596

(CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977).

"When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the prima facie case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. *In re Best*, 562 F.2d at 1255, 195 USPQ at 433. See also *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See also *In re Ludtke*, 441 F.2d 660, 169 USPQ 563 (CCPA 1971); *Northam Warren Corp. v. D. F. Newfield Co.*, 7 F. Supp. 773, 22 USPQ 313 (E.D.N.Y. 1934). See MPEP § 2112.01.

With respect to the doped-ceria and cobalt iron based cathode each being formed from colloidal spray deposition or aerosol spray casting (respective claims 8 and 9):

These claims do not further define the structure of the claims and are instead drawn to the process of making the particular components in each claim.

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-



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process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted).

“The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature” than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

In the instant case, the prior art rejection obviates the use of doped-ceria as the electrolyte, thus the end product is obvious. Since the claimed invention is drawn to the fuel cell and not a method of making the fuel cell, the manner in which the doped-ceria is not germane to the claimed invention absent clear evidence to the contrary.

With respect to claims 12-17:

Mogensen discloses a solid oxide fuel cell (SOFC), comprising an anode including doped ceria (abstract and col. 3, line 9 through col. 4, line 4) and a methane fuel (col. 2, ll. 56 as applied to claim 12).

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The fuel source of Mogensen can be either hydrogen or methane. The operating temperature of claim 14 does not further limit the SOFC fuel cell system and is not accorded patentable weight since it is an intended operational use of the fuel cell of claim 14 (col. 2, ll. 54-57 as applied to claim 14). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

The anode is composed of NiO/doped ceria (col. 2, ll. 19-52 as applied to claim 17).

The differences between the instant claims and Mogensen are that Mogensen does not teach of the electrolyte containing doped-ceria (claim 12) or of the cathode containing a cobalt iron based material (claim 12), of the fuel cell operating in a temperature range of 400-700° C (claim 13), operating the cell at about 550° C (claim 14), of operating the of the fuel being hydrogen and a power output of up to 400 mW/cm<sup>2</sup> is produced at an operating temperature of 550° C (claim 15), of the fuel being methane and wherein a power output of 320 mW/cm<sup>2</sup> is produced at an operating temperature of 550° C (claim 16), of the cathode containing a cobalt iron based material (claim 1) and more particularly a cathode material of either (La,Sr)(Co,Fe)O<sub>3</sub> or (La,Ca(Co,Fe,Mn)O<sub>3</sub> (claim 19).

With respect to an electrolyte containing doped ceria (claim 12):

The electrolyte of Mogensen is YSZ (yttria stabilized zirconia).

EP '356 discloses that doped ceria electrolytes ( $\text{CeO}_2$  doped with materials such as  $\text{CaO}$  or  $\text{Gd}_2\text{O}_3$ ) compared to zirconia based electrolytes are preferable since they exhibit higher conductivity than the zirconia based electrolytes and can be operated at lower temperatures (page 3, ll. 42-45).

The motivation for using doped-ceria electrolyte is that it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by using doped-ceria electrolyte since it would have improved the conductivity of the electrolyte and further reduced the operating temperature of the SOFC.

With respect to the cathode containing cobalt iron based material (claim 12):

Wallin discloses of an electrode/electrolyte combination used in solid oxide fuel cells (abstract, col. 1, ll. 12-20, and col. 3, ll. 13-15 and 56-65) wherein the ion-conducting material in the electrode is a number of perovskite compositions. In particular when the ionically conductive material is ceria or doped ceria, Wallin teaches that the electrocatalyst in the electrode is preferably a cobalt iron based material, and further a  $\text{LaSrFeCoO}_3$  material (col. 6, ll. 7-9).

The motivation for using a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode to be a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  since it would have lowered the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

With respect to the operating temperature of claims 13-16:

As discussed above, EP '356 discloses that the use of doped-ceria electrolytes provide much higher conductivity than zirconia based electrolytes. Thus there is ample motivation for replacing the zirconia electrolyte of Mogensen with a doped-ceria electrolyte to provide an electrolyte having a higher conductivity at lower operational temperatures. The combination of the teachings of Mogensen, EP and Wallin as set forth above teach all of the same components as recited in claims 13-16. Since the components are the same, there is a reasonable expectation of success that the fuel cell described above would effectively operate at an operational temperature of 550° C

and achieve the same power outputs, absent clear evidence to the contrary. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

"[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the prima facie case can be rebutted by evidence showing that the prior art products do not necessarily possess the characteristics of the claimed product. In re Best, 562 F.2d at

1255, 195 USPQ at 433. See also *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See also *In re Ludtke*, 441 F.2d 660, 169 USPQ 563 (CCPA 1971); *Northam Warren Corp. v. D. F. Newfield Co.*, 7 F. Supp. 773, 22 USPQ 313 (E.D.N.Y. 1934). See MPEP § 2112.01.

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With respect to the power output of the cell at an operational temperature of 550° C (claim 15):

As discussed above, Mogensen teaches that the fuel can be hydrogen. Mogensen in view of EP '356 and Wallin obviates the fuel cell of claim 15. Upon using hydrogen fuel in the cell of Mogensen in view of EP '356 and Wallin, since the composition of the fuel cell and the fuel used are the same as the instant claim, the prior art of record will generate the same power output when operated at a temperature of about 550° C.

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

With respect to the power outputs of the cell at an operational temperature of 550° C (claim 16):

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As discussed above, Mogensen teaches that the fuel can be hydrogen.

Mogensen in view of EP '356 and Wallin obviates the fuel cell of claim 16. Upon using hydrogen fuel in the cell of Mogensen in view of EP '356 and Wallin, since the composition of the fuel cell and the fuel used are the same as the instant claim, the prior art will inherently generate the same power output when operated at a temperature of about 550° C.

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

### ***Response to Arguments***

6. Applicant's arguments filed January 14, 2003 have been fully considered but they are not persuasive.

Applicant argues that none of the prior art of record teaches or suggests the claimed operating temperature of 400°C to 700°C. The examiner respectfully disagrees.

As discussed above, EP '356 discloses that the use of doped-ceria electrolytes provide much higher conductivity than zirconia based electrolytes. Thus there is ample motivation for replacing the zirconia electrolyte of Mogensen with a doped-ceria electrolyte to provide an electrolyte having a higher conductivity at lower operational

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temperatures. The combination of the teachings of Mogensen, EP and Wallin as set forth above teach all of the same components as discussed above. Since the components are the same, there is a reasonable expectation of success that the fuel cell described above would effectively operate at an operational temperature from 400°

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C to 700° C and further operate at specified temperatures within that range, such as 550° C thereby achieving the same power outputs, absent clear evidence to the contrary.

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). See MPEP § 2114, incorporated herein.

"[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been



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established. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977).

"When the PTO shows a sound basis for believing that the products of the applicant and

the prior art are the same, the applicant has the burden of showing that they are not." In

re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the

prima facie case can be rebutted by evidence showing that the prior art products do not

necessarily possess the characteristics of the claimed product. In re Best, 562 F.2d at

1255, 195 USPQ at 433. See also Titanium Metals Corp. v. Banner, 778 F.2d 775, 227

USPQ 773 (Fed. Cir. 1985). See also In re Ludtke, 441 F.2d 660, 169 USPQ 563

(CCPA 1971); Northam Warren Corp. v. D. F. Newfield Co., 7 F. Supp. 773, 22 USPQ

313 (E.D.N.Y. 1934). See MPEP § 2112.01.

Applicant's statement that the prior art of record merely does not teach or suggest the claimed invention fails to clearly argue the prior art rejection of record and establishes no clear basis for withdrawing the prior art rejection of record. The Examiner maintains the prior art rejections for the reasons set forth above.

### ***Claim Rejections - 35 USC § 103***

7. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mogensen in view of EP '356 and Wallin as applied to claims 1-3, 6-9 and 12-17 above, and further in view of either U.S. patent No. 6,458,170 (Visco) or U.S. patent No. 5,306,411 (Mazanec).

The teachings of Mogensen in view of EP '356 and Wallin have been discussed above, incorporated herein.

Note: it appears that the use of the starch or carbon is particular to the process of forming pores in the fuel cell and therefore is not readily present in the fuel cell product of the claims since this material forms the pores in the fuel cell. Thus the pore former is not clearly an integral component of the fuel cell and is an intermediary component for forming pores which is a temporary component of the cell and in order to fabricate the pores of the cell cannot be present, else the pores would not exist in the fuel cell system and ion transport of the cell would be inhibited. However, for the record, such an intermediate component as a pore-forming material is known and obvious.

Visco teaches that it is desired to form a SOFC having a pores therein. In order to form pores in a ceria based material it is well known in the art to impart a starch material in a fuel cell component and thereafter dissolve the starch to form the pores (col. 6, ll. 38-40). Mazanec similarly teaches of the desire to form a porous component in a SOFC (col. 47, ll. 17-23).

The motivation for forming pores in a SOFC fuel cell is to enable and enhance ionic conductivity of the fuel cell system.

The motivation for providing starch in the fuel cell is to effectively form the pores in the fuel cell by dissolving the starch from the fuel cell. The result being a porous component of the fuel cell having enhanced ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by providing a starch to the fuel cell since it would have provided a means for forming pores in the fuel cell which would have enhanced the ionic conductivity of the fuel cell.

***R sponse to Argum nts***

8. Applicant's provides no additional arguments to the rejection of claims 4 and 5 apart from those arguments discussed in item 6 above, incorporated herein.

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***Claim Rejections - 35 USC § 103***

9. Claims 18-20 rejected under 35 U.S.C. 103(a) as being unpatentable over Mogensen in view of EP '356 and Wallin as applied to claims 1-3, 6-9 and 12-17 above, and further in view of U.S. patent No. 5,672,437 (Yajima).

The teachings of Mogensen in view of EP '356 and Wallin have been discussed above, incorporated herein.

The doping material in the ceria of Mogensen can be gadolinium oxide, lanthanide oxide and yttria oxide (col. 4, ll. 1-3 as applied to claim 20).

The differences not yet discussed are of the electrolyte further comprising doped-zirconia (claim 18) and of using a cathode comprising (La,Sr)(Co,Fe) O<sub>3</sub> (claim 19).

With respect to claim 18:

Yajima teaches of solid electrolyte consisting essentially of cerium oxide can be used in place of a stabilized-zirconia electrolyte . However, if the fuel gas fed on its anode's side is H<sub>2</sub>, CH<sub>4</sub> or the like, the cerium oxide contained in the electrolyte may be partially reduced under the effect of the fuel gas at its operating temperature, which can present a problem of a decrease in terminal voltage. The above-mentioned problem

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can be solved by bonding a thin membrane of stabilized zirconia on the anode's side surface of the cerium oxide electrolyte . Chemical vapor deposition (CVD), electrochemical deposition (EVD), thermal spraying and the like have been proposed as a method for forming the thin membrane of stabilized zirconia (col. 1, ll. 19-31).

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The bilayered structure represents an electrolyte wherein the cerium oxide has an interfacial region on the anode side surface of ceria and stabilized (doped) zirconia. This prevents partial reduction of the ceria portion of the electrolyte.

The motivation for incorporating doped zirconia to the doped-ceria electrolyte is that it prevents partial reduction of the ceria portion of the electrolyte from the fuel gas.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by further providing doped-zirconia with the doped-ceria of the electrolyte since it would have prevented partial reduction of the ceria portion of the electrolyte from the fuel gas.

With respect to claim 19:

The amendment to claim 19 has changed the materials specified as cathode materials. This lends claim 19 to a new grounds of rejection necessitated by amendment. In light of the amendment, Weber is no longer applicable. However Wallin teaches of the newly claimed cathode materials as discussed below.

Wallin discloses of an electrode/electrolyte combination used in solid oxide fuel cells (abstract, col. 1, ll. 12-20, and col. 3, ll. 13-15 and 56-65) wherein the ion-conducting material in the electrode is a number of perovskite compositions. In

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particular when the ionically conductive material is ceria or doped ceria, Wallin teaches that the electrocatalyst in the electrode is preferably a cobalt iron based material, and further a  $\text{LaSrFeCoO}_3$  material (col. 6, ll. 7-9).

The motivation for using a cobalt iron based cathode material including

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$\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode to be a cobalt-iron based cathode material including  $\text{LaSrFeCoO}_3$  since it would have lowered the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

### ***Response to Arguments***

10. Applicant's arguments filed January 14, 2003 have been fully considered but they are not persuasive.

Applicant argues that none of the prior art of record teaches or suggests the claimed operating temperature of 400°C to 700°C. The examiner respectfully disagrees (see item 6 above, incorporated herein).

Applicant further appears to argue that the Yajima reference fails to teach of the specific electrolyte as recited in claim 18. The examiner respectfully disagrees.

As discussed above in the prior art rejection of claim 18, Yajima discloses of a cerium oxide (ceria) electrolyte wherein an additional layer of zirconia (see col. 1, ll. 19-31) and further of electrolyte compositions of both ceria and zirconia (see col. 3, ll. 27-29 and col. 4, ll. 15-18). The bilayered structure represents an electrolyte wherein the cerium oxide has an interfacial region on the anode side surface of ceria and stabilized (doped) zirconia. This prevents partial reduction of the ceria portion of the electrolyte. The motivation for incorporating doped zirconia to the doped-ceria electrolyte is that it prevents partial reduction of the ceria portion of the electrolyte from the fuel gas.

Applicant then argues that the prior art of record does not teach or suggest the cathode materials of claim 19. The examiner respectfully disagrees.

As discussed above, the scope of the materials for the cathode in claim 19 have been amended. In response to such it is held that Wallin teaches of such a cathode material. The motivation for using a cobalt iron based cathode material including  $\text{LaSrFeCoO}_3$  is that it lowers the internal resistance of the fuel cell based on the optimal selection of the electronically conductive material and electrocatalyst (abstract).

Applicant also argues that the prior art of record does not teach or suggest the limitations of claim 20. The examiner respectfully disagrees.

The doping material in the ceria of Mogensen can be gadolinium oxide, lanthanide oxide and yttria oxide (col. 4, ll. 1-3 as applied to claim 20). Thus no

secondary reference is relied upon for the teachings of claim 20, since the primary reference of Mogensen teaches the limitations of claim 20.

***Claim Rejections - 35 USC § 103***

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11. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mogensen in view of EP '356 and Wallin as applied to claims 1-3, 6-9 and 12-17 above, and further in view of U.S. patent No. 5,932,146 (Kuo) and Weber et al. "Electronic, Ionic and Mixed Type Conductors in SOFC" (hereinafter referred to as Weber).

The teachings of Mogensen in view of EP '356 and Wallin have been discussed above, incorporated herein.

The cathode material is desirably a perovskite structure ( $ABO_3$ ). It is well known in the art to provide air electrodes (cathodes) having a perovskite-like crystal structure of the formula  $ABO_3$ , wherein the A-site comprises a combination of a mixed lanthanide and multiple A-site dopants, and the B-site comprises a combination of Mn and at least one B-site dopant. The mixed lanthanide preferably comprises La, Ce, Pr and, optionally, Nd. The A-site dopants include at least one rare earth element selected from La, Ce, Pr, Nd, Sm, Eu and Gd, and at least one alkaline earth element selected from Ca, Sr and B. The B-site dopant is selected from Mg, Al, Cr, Ni, Co, Fe and combinations thereof (see abstract and col. 2, ll. 50-61 of Kuo). Weber further teaches that the perovskite cathode material is selected from combinations of A-site dopants of (La, Sr, Ca) and combinations of B-site dopants of (Cr, Mn, Fe, Co, Ni) (page 5) and that

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the particular dopant combinations can be adjusted and varied to optimize the thermal coefficient of expansion resulting in delamination at the cathode/electrolyte interface.

Any combination of these materials would have been obvious to one of ordinary skill in the art to while providing a cathode having a coefficient of thermal expansion

which closely matches the other components of the fuel cell and decreasing the internal resistance of the fuel cell.

The motivation for using a cathode of La-Sr-Co-Fe-Mn-O<sub>3</sub> in a fuel cell is that it would have provided an air cathode of a perovskite crystal structure which decreases the internal resistance of the fuel cell.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Mogensen by selecting the cathode material to be La-Sr-Co-Fe-Mn-O<sub>3</sub> in a fuel cell since it would have provided a cathode material having coefficient of thermal expansion which closely matches the other components of the fuel cell decreased the internal resistance of the fuel cell. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

Further with respect to forming the cathode of claim 11 by colloid spray deposition:

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of



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a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted).

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The Patent Office bears a lesser burden of proof in making out a case of prima facie obviousness for product-by-process claims because of their peculiar nature” than when a product is claimed in the conventional fashion. In re Fessmann, 489 F.2d 742, 744, 180 USPQ 324, 326 (CCPA 1974). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product. In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983). Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989). See MPEP section 2113.

In the instant case, the prior art rejection obviates the use of a cobalt iron manganese based cathode, thus the end product is obvious. Since the claimed invention is drawn to the fuel cell and not a method of making the fuel cell, the manner in which the cathode is formed is not germane to the claimed invention absent clear evidence to the contrary.

***R sponse to Arguments***

12. Applicant's arguments filed January 14, 2003 have been fully considered but they are not persuasive.

Applicant argues that none of the prior art of record teaches or suggests the claimed operating temperature of 400°C to 700°C. The examiner respectfully disagrees (see item 6 above, incorporated herein).

Applicant further appears to argue that the Kuo and Weber fail to teach of the specific materials of claims 11, 19 and 20. The examiner respectfully disagrees.

This argument is only applicable to claim 11, since the amendment to claim 19 has materially altered the materials of the cathode therein and since claim 20

As discussed above in the prior art rejection of claim 11, Kuo teaches of cathode materials composed of Co, Fe and Mn are known(see abstract and col. 2, ll. 50-61 of Kuo). In reading the disclosure of Kuo at col. 2, the perovskite structure is the formula  $ABO_3$ . Wherein A comprises a combination of lanthanum and calcium or strontium. Thus there is a teaching of A being (La,Ca) or (La,Sr) in the  $ABO_3$  perovskite structure. The B constituent comprises Mn and at least one b site dopant selected from a group which includes Fe, Co and combinations therein. Thus the B constituent appreciated a plurality of combinations which includes one combination of (Mn,Fe,Co). Kuo does not teach that any particular combination is not acceptable and teaches that numerous combinations of these materials are capable of being employed as cathode materials in a solid oxide fuel cell. Such combination would have led one of ordinary skill in the art to employ the combinations set forth in claims 11 and 19. Also, Weber teaches that

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cathode materials composed of Co, Fe and Mn based materials are known in the art (page 5 as underlined in the reference copied submitted to Applicant).

The motivation for using a cathode of comprising combinations of materials including (La, Ca)(Mn,Co,Fe)O<sub>3</sub> in a fuel cell is that it would have provided an air cathode of a perovskite crystal structure which decreases the internal resistance of the fuel cell.

### ***Conclusion***

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the

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examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-

2383. FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo  
Patent Examiner  
Art Unit 1745

gc

*Patrick Ryan*  
*SPE-ART Unit 1745*

March 5, 2003